THE RESPIRATORY SYSTEM:
IT'S A GAS

LEARNING OBJECTIVES

età List and state the basic functions of the components of the respiratory system
età Differentiate between respiration and ventilation
età Explain how the respiratory system warms and humidifies inhaled air
età State the purpose and function of the mucociliary escalator

età Discuss the process of gas exchange at the alveolar level
età Describe the various skeletal structures related to the respiratory system
età Explain the actual process and regulation of ventilation
età Discuss several common respiratory system diseases
ETHICAL DILEMMA

1. When I worked in the neonatal intensive care unit, we had a baby born to a mother who had been smothered with a pillow by the baby's

ANSWERS TO TEST YOUR KNOWLEDGE

Test Your Knowledge 14–1 Answers, p. 339

1. d
2. a
3. c
4. c
5. d

Test Your Knowledge 14–2 Answers, p. 343

1. d
2. d
3. c
4. d
5. b
6. b

Test Your Knowledge 14–3 Answers, p. 350

1. d
2. b
3. a
4. d
5. a
6. a

Test Your Knowledge 14–4 Answers, p. 356

1. b
2. d
3. d
4. d
5. c
ANSWERS TO THE CASE STUDY, P. 360

a. This could be an asthma flare-up, given his history, and also pneumonia because he has had a bad cold for several days.
b. Medication to bronchodilate (open) the airways and fluids and oxygen for the cyanosis are indicated. If this is a bacterial pneumonia, antibiotics could also be indicated.
c. Decrease in heart rate and breathing toward normal, decreased use of accessory muscles, improvement in skin color (less cyanosis), and less or a clearing of secretion production would suggest treatment was working.

ANSWERS TO REVIEW QUESTIONS, P. 361

Multiple Choice
1. d, 2. b, 3. b, 4. d, 5. c, 6. a

Fill in the Blank
1. bronchioles
2. olfaction; phonation
3. cilia; sol; gel
4. sinuses
5. increase; in

Short Answer
1. The inner layer of the bronchus is the epithelial layer, (mucociliary escalator or pseudostratified ciliated columnar cells). A middle layer contains smooth muscle, lymph, and nerves. The outer layer is the cartilaginous layer.
2. The blood entering the pulmonary capillaries from the pulmonary arteries is oxygen poor and carbon dioxide rich. The air in the alveoli is oxygen rich and carbon dioxide poor. So, there is net diffusion of oxygen from the alveoli into the capillaries and carbon dioxide from the capillaries into the alveoli down the concentration gradients for both chemicals. Thus oxygen enters the bloodstream, and carbon dioxide leaves the bloodstream in the lungs.
3. Surfactant is vitally important. It prevents collapse and adhesion of alveoli when air leaves the lungs. Without surfactant, alveoli would quickly become damaged. Surfactant also prevents overexpansion of the alveoli during inspiration.
4. A nerve impulse is sent from the medulla oblongata down the spinal cord to the phrenic nerve to the diaphragm. The diaphragm contracts. When the diaphragm contracts, it flattens, increasing thoracic and lung volume. When the volume increases, the pressure in the lungs
decreases to lower than atmospheric pressure. Air flows down the pressure gradient into the lungs. This is the mechanism of inspiration. It is an active process, requiring contraction of the diaphragm. Expiration is a passive process. When the nerve impulse shuts off, the diaphragm contracts, decreasing the volume and increasing the pressure in the lungs. Air is pushed out of the lungs by this increased pressure.

5. The wall of the tracheobronchial tree has three major changes as you move from conducting to respiratory zone. The amount of cartilage decreases, the epithelium changes from respiratory mucosa, to cuboidal epithelium to simple squamous epithelium, and the amount of smooth muscle decreases. There is no cartilage or smooth muscle in the respiratory zone.